	Application No.	Applicant(s)
Notice of Allowability	10/007,460	BALAN ET AL.
	Examiner	Art Unit
	Brian T. Pendleton	2644

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *amendment on 4/22/05*.

2. ☒ The allowed claim(s) is/are *2-11,13 and 15-24*.

3. ☒ The drawings filed on *05 December 2001* are accepted by the Examiner.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a) ☐ All   b) ☐ Some*   c) ☐ None   of the:

        1. ☐ Certified copies of the priority documents have been received.

        2. ☐ Certified copies of the priority documents have been received in Application No. _____ .

        3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

    * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application. **THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.

    (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached

        1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____ .

    (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)

2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)

3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____

4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material

5. ☐ Notice of Informal Patent Application (PTO-152)

6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .

7. ☐ Examiner's Amendment/Comment

8. ☒ Examiner's Statement of Reasons for Allowance

9. ☐ Other _____ .

DETAILED ACTION

Allowable Subject Matter

Claims 2-11, 13, and 15-24 are allowed.

The following is an examiner's statement of reasons for allowance:

Independent claim 3 is directed to a method of filtering noise from a mixed sound signal to obtain a target signal requiring inputting the mixed signal through a pair of microphones, separately Fourier transforming the mixed signal into the frequency domain, computing a signal short-time spectral amplitude from the transformed signals, computing a signal short-time spectral complex exponential from the transformed signals and computing the target signal in the frequency domain from the spectral amplitude and complex exponential. These features are met by the combination of Gustafsson et al and Ephraim et al (see previous Office Action). However, claim 3 has been amended to involve computing a spectral power matrix and using the power matrix to compute the spectral amplitude and spectral complex exponential. The prior art of record does not teach nor suggest the use of a spectral power matrix. As a result, claim 3 and its dependents claims 2 and 4-10 are allowed.

Independent apparatus claim 11 similarly comprises a pair of input channels for receiving mixed signals from a pair of microphones, a pair of Fourier transformers each receiving a mixed signal from one of the channels, a filter for receiving the transformed signals and computing a signal short-time spectral amplitude and signal short-time spectral complex exponential from the transformed signals and computing a target signal from the spectral amplitude and complex exponential. As stated in the previous Office Action, the combination of Gustafsson et al and Ephraim et al meets those limitations. Nevertheless, the prior art of record does not disclose nor

suggest a spectral power matrix updater for computing a spectral power matrix and outputting

the matrix to the filter, which the claim has been amended to included. As a result, claim 11 and

its dependent, claim 13 is allowed.

Independent method claim 16 is directed to a similar method of claim 3 with the method

steps embodied as a program of instructions stored on a program storage device readable by a

machine and executable by the machine. The claim requires inputting the mixed signal through a

pair of microphones, separately Fourier transforming the mixed signal into the frequency

domain, computing a signal short-time spectral amplitude from the transformed signals,

computing a signal short-time spectral complex exponential from the transformed signals and

computing the target signal in the frequency domain from the spectral amplitude and complex

exponential which is met by the combination of Gustafsson et al and Ephraim et al. However,

claim 16 has been amended to involve computing a spectral power matrix and using the power

matrix to compute the spectral amplitude and spectral complex exponential. The prior art of

record does not teach nor suggest the use of a spectral power matrix. As a result, claim 16 and

its dependents claims 15 and 17-22 are allowed.

Independent claim 23 also recites inputting a mixed signal through a pair of microphones,

separately Fourier transforming each mixed signal into the frequency domain, computing a

signal short-time spectral amplitude and signal short-time spectral complex exponential from the

transformed signals and computing a target signal. These limitations were suggested by the

combination of Gustafsson et al and Ephraim et al. The claim also recites the step of calibrating

a function K(w) by the estimation equation:

$$K(\omega)=\frac{\sum_{l=1}^{c}X_2^c(l,\omega)\overline{X_1^c(l,\omega)}}{\sum_{l=1}^{c}|X_1^c(l,\omega)|^2}$$

where $X_1^c(l,\omega)$, $X_2^c(l,\omega)$ represents the discrete windowed Fourier transform at frequency ω, and time-frame index l of the transformed signals x_1^c, x_2^c within time frame c.

The prior art of record does not teach nor suggest the specific claimed equation and therefore claim 23 is allowed.

Independent claim 24 recites inputting a mixed signal through a pair of microphones, separately Fourier transforming each mixed signal into the frequency domain, computing a signal short-time spectral amplitude and signal short-time spectral complex exponential from the transformed signals and computing a target signal. As state above, these limitations were suggested by the combination of Gustafsson et al and Ephraim et al. The claim also states updating a function K(w) equal to a ratio of one said Fourier transformed signal to the other, the updating according to the equation:

$$K^c(\omega)=(1-\alpha)K^{c-1}(\omega)+\alpha K(\omega)$$

where α is an adaptation rate.

The prior art of record does not teach nor suggest the specific updating function claimed above and therefore claim 24 is allowed.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue
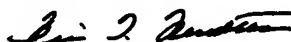
fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for

Allowance."

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Brian T. Pendleton whose telephone number is (571) 272-7527.

The examiner can normally be reached on M-F 7-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Sinh Tran can be reached on (571) 272-7564. The fax phone number for the

organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent

Application Information Retrieval (PAIR) system. Status information for published applications

may be obtained from either Private PAIR or Public PAIR. Status information for unpublished

applications is available through Private PAIR only. For more information about the PAIR

system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR

system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Brian T. Pendleton
Examiner
Art Unit 2644

btp

BRIAN PENDLETON
PATENT EXAMINER